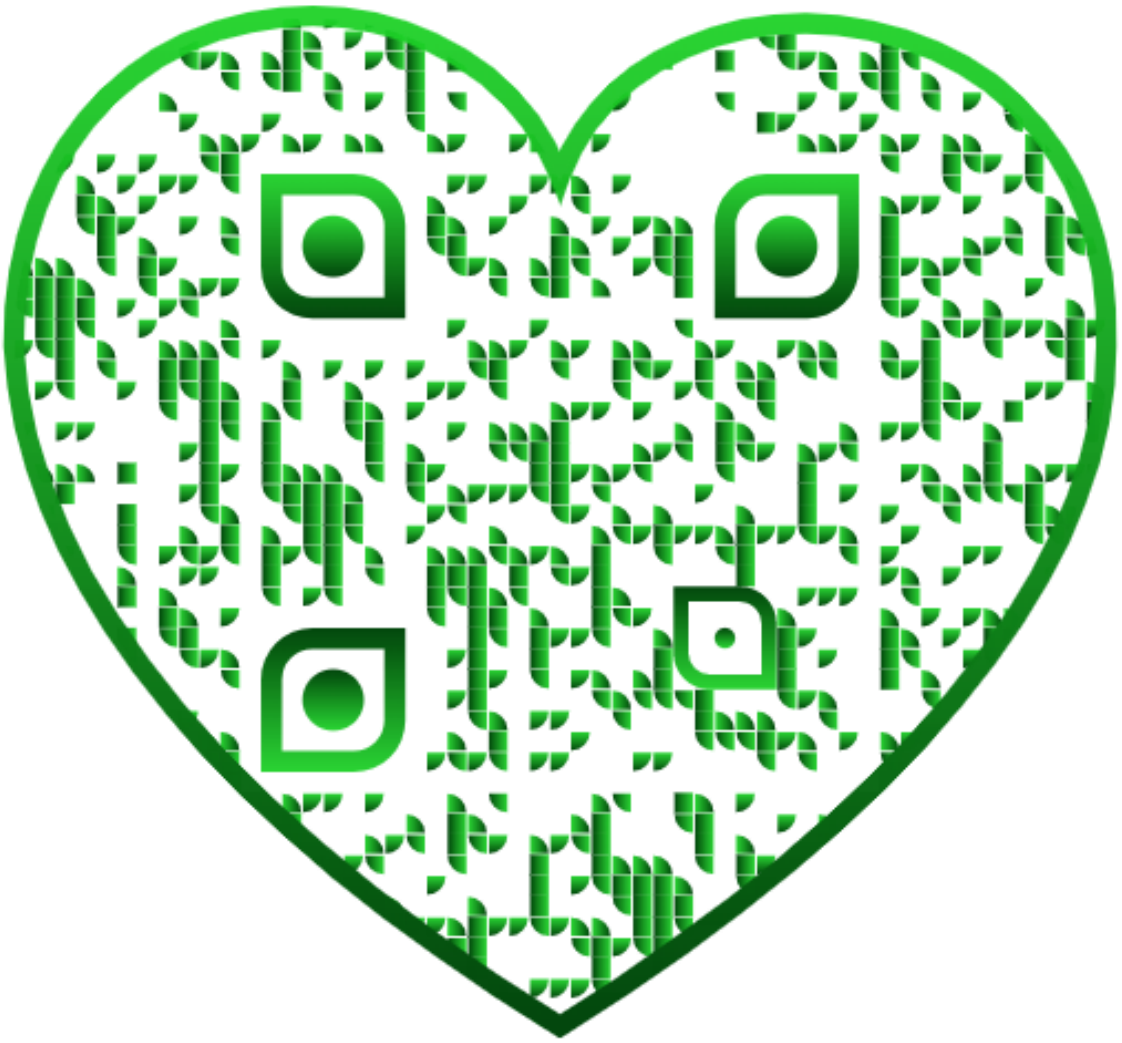
9. Cosmetics



Introduction

- Definition
  - Cosmetics are substances used to enhance or protect the appearance or odor of the human body.
  - FDCA defines cosmetics as
    - Articles intended to be rubbed, poured, sprinkled, or sprayed on, introduced into, or otherwise applied to the human body or any part thereof for cleansing, beautifying, promoting attractiveness, or altering the appearance.
    - Soap is specifically excluded from cosmetics in the FDCA (Food, Drug, and Cosmetics Act).
    - The devices used in applying the cosmetics as brush, comb razor blades they are not included in cosmetics.

- History of cosmetics
  - Spans at least 6000 years of human history, and almost every society on earth.
  - Archeological evidence of cosmetics dates at least from ancient Egypt and Greece
  - Ancient Egyptians used caster oil as a protective balm.
  - Skin creams made of beeswax, olive oil, and rosewater described by the Romans.

- The Biblical book of Esther describes various beauty treatments as well.
- Cosmetic use was frowned upon at some points in history.
  - In the 1800s, make-up was used primarily by prostitutes, and Queen Victoria publicly declared the use of makeup by actors.
- Its only in the 20th century has great progress been made in the diversification of products and functions and in the safety and protection of the consumer.
- Before 1938, cosmetics were not regulated as drugs.

Formulation of Cosmetics

Ingredients

- The target substance in cosmetic products may not be easily applied on the human body,
  - It may be dissolved into or mixed with different kinds of chemical additives.
  - Excipients may be used to **bulk up** cosmetical formulations with very potent target substances, to allow for convenient and accurate dosage.

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- Once cosmetic products have been formulated, it may not stay in active form for long.
  - To **stabilize** the product, some excipients are added, ensuring that the target ingredient stays "active", and, just as importantly, stable for a sufficiently long period of time.
- All ingredients in cosmetics are require to be safe.
  - Excipients are only used when absolutely necessary and in the smallest amounts possible.

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Fillers/Diluents

- Fillers fill out the amount of the product, making it practical to produce and convenient for the consumer to use.
  - Provide proper volume for consumer handling.
- A varied group of oily or water soluble polymers are used.

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Color additives

- Added to improve appearance of a formulation.
- Vital to any product that is intended to alter the color of any part of the body.
- Color materials mixed in with cosmetics can be broadly classified in to:
  - Organic synthetic colors, Natural colors, Inorganic pigments and Polymer powders.

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Organic synthetic coloring agents

- Can be classified in to three basic groups: dyes, lakes, and pigments

Dyes

- Compounds that are soluble in solvents such as water, oils and alcohols and imparts color according to the solubility in the cosmetics base.

- Water-soluble dyes have a hydrophilic group such as sulfonate in the molecule.

- **Azido dyes**: the majority of permitted dyes are in this group.
  - Characterized by the azido-group chromophore (-N=N-) and with or without sodium sulfonate (water soluble or oil soluble)
  - Water soluble dyes are used as coloring agents in lotion and shampoos.
  - Oil soluble dyes are used in cosmetics such as hair oils.

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- **Xanthene dye**: acidic and basic types.
  - The acidic type include quinoid type (e.g. Floxine B) and lactone type (e.g. Tetrabromofluorescein)
    - Often used as dyes in lipsticks.
  - The basic type (e.g. Rhodamine B) have high chrominance, excellent coloring power, and good durability against sunlight
    - Widely used in lotions and shampoos

- **Other dyes**
  - Quinoline dyes e.g. quinoline yellow SS and quinoline yellow WS
  - Triphenylmethane dyes: e.g. brilliannt blue FCF
  - Anthraquinone dyes e.g. Alizanine cyanine green F and Quinizarin green SS

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Lakes

- Lake pigment are insoluble metallic salts (calcium) of water soluble dyes
- Dye lakes are material made by reacting high-solubility dyes such as sunset yellow FCF and Eosin YS with insoluble salts of aluminum or zirconium.
- Used in lipsticks, rouge and nail enamels.

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Organic pigments

- Do not have a soluble group in their structure and they are colored powders that are insoluble in water, oils and other solvents

- Permitted organic pigments are broadly classified into azo-type pigments (e.g. permatone), indigo or thio-indigo-type pigments (e.g. Helidone pink CN) and phathalocyanine type pigments (e.g. phthalocyanine blue).

Natural Colors

- In comparison to synthetic colors, they have poor coloring power and lower light and chemical tolerance.
  - E.g. Carotenoid and Flavonoid, Flavins, Quinones, Porphyrins, Diketones, Betacyanidine groups

Group	Sub-group	Material	Color	Source
Carotenoids		β-Carotene	Yellow-orange	Carrots
		β-apo-8-carotinal	Yellow-orange	Oranges
		Capsantin	Orange-red	Paprika
		Lycopene	Orange-red	Tomato
		Bixin	Yellow-orange	Annatto
		Crocin	Yellow	Gardenia
		Canthaxanthin	Red	Mushrooms
Flavonoids	Anthocyanidin	Shisonin	Purple-red	Beefsteak plant
		Raphanin	Red	Turnips
		Enocyanin	Purple-red	Grapes
	Chalcones	Carthamin	Red	Safflower (Carthamus tinctorius L.)
		Safflor yellow	Yellow	
	Flavonols	Rutin	Yellow	Soba or buckwheat
		Quercetin	Yellow	Black oak bark
	Flavones	Cacao color	Brown	Cacao bean

Flavins		Lipoflavin	Yellow	Yeast
Quinones	Anthraquinones	Laccaic acid	Orange-red/purple	Scale bug
		Carmine acid(cochineal)	Blue-red	Cochineal bug(cactus)
		Kermesic acid	Orange-red/purple	Cochineal bug(Kermes or Japanese oak)
		Alizarine	Orange	Western madder
	Naphthoquinones	Shikonin	Purple	Shikon
		Alkannin	Dark red	Roots of purple plants(Alkanna)
		Echinochrome	Yellow	Sea urchins
Porphyrines		Chlorophyll	Green	Green leaves
		Hemoglobin	Dark red-brown	Blood
Diketones		Curcumine(Turmeric)	Yellow	Curcuma longa L.
Betacyanidine		Betanin	Red	Beet

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Inorganic pigments (mineral pigments)

- Most inorganic pigments are synthetic.
- They have good light and heat tolerance.
- They have excellent characteristics such as insolubility in organic solvents but on the other hand they are not as brilliant as organic pigments.

- Inorganic pigments classified into:
  - Coring pigments ~ adjust the product color
  - White pigments ~ control the covering power and color
  - Extender pigments ~ adjust the product usage characteristics (extensibility and adhesiveness) as well as the luster.
  - Perlescent pigments ~ give the product a lustrous quality
  - New functional pigments ~ are mixed in the product to increase the product usability and makeup effectiveness

Usage Classification	Pigment
Extender Pigments	mica, talc, kaolin, calcium carbonate, magnesium carbonate, anhydrous silicate, aluminum oxide, barium sulfate
Coloring Pigments	ferrous oxide, yellow iron oxide, black iron oxide, chromium oxide, ultra-marine, prussian blue, carbon black
White Pigments	titanium dioxide, zinc oxide
Perlescent Pigments	titanium dioxide coated mica, fish scales flake, bismuth oxychloride
New functional Pigments	boron nitrite, photochromic pigment, synthetic phlogopite, synthetic iron included phlogopite, hybrid fine powder

Polymer powders

- Includes
  - Polyethylene powder
  - Polymethylmethacrylate
  - Polyethyelenerephthalate polymethylmethacrylate laminated powder
  - Nylon powder

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Lubricants

- Prevent ingredients from clumping together and from sticking the processing machines

An antioxidant

- Preventing the oxidation of other additives.
- E.g. thiols or polyphenols.

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Fragrances

- Give the product a fresh, pleasing odor and cover up the smell of other ingredients.
- Fragrances in skin-care products are the most likely cause of skin irritations or contact allergies.
- E.g. cinnamic alcohol, hydroxycitronella and isoeugenol

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Preservatives

- Any product that includes water and oil must contain one or more preservatives.
  - These may cause skin reactions
  - E.g. diazolidinyl urea, imidazolidinyl urea, quaternium 15, and the parabens.

Emulsifier

- A type of surfactant typically used to keep emulsion well dispersed.

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Humectants

- Maintaining a young-looking is closely connected with moisture content.
- The keratin layer of the skin contain natural moisturizing factors (NMF) with hydrophilic moisture absorbing compounds
- Sodium salt of pyrrolidonecarboxylate is the most important factor in NMF.

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- Cosmetics should be able to mimics this natural moisture retention mechanism.
- Humectants are water soluble materials with high water absorption capacity.
- They absorb water from the air and hold the moisture in the skin, useful in softening thickened or scaly skin.
- E.g. polyhydric alcohols like, glycerin, propylene glycol, sorbitol

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- Main requirements of humectants are:
  - Must have and maintain appropriate water absorption ability,
  - Water absorption must not be influenced by changing environmental conditions (temperature, humidity),
  - Water absorption ability must maintain moisture in the skin,
  - Must have lowest possible volatility
  - Must have good miscibility with other constituents
  - Must be safe, colorless, odorless and tasteless
  - Must have densities matching the system they are used in

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- Glycerin
  - Obtained as a byproduct in manufacturing of soap from plant and animal fats and oils.
  - When dehydrated and deodorized, it is colorless, odorless liquid.
- Propylene glycol
  - It looks and feels much like glycerin and is colorless and odorless
  - It has a better feeling on use due to its lower viscosity than glycerin

- Sorbitol
  - It is white odorless solid and obtained by reduction of glucose
  - It has lower hygroscopic property
  - It has a humectant effect at low humidity and used in creams, lotions, toothpaste
- Sodium lactate
  - Occur in NMF, and have a higher water absorption ability

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- Sodium 2-pyrrolidone-5-carboxylate
  - Excellent hygroscopic and humectant effect
- Sodium hyaluronate
  - It is sodium salt of Hyaluronic acid and a white water-soluble powder
  - Properties like viscosity and humectance vary with the Mwt
  - It is almost unaffected by environmental humidity.

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Emollients

- These ingredients fill in the spaces between the cells in the skin
- Thus soothing and lubricating rough skin
- E.g. butyl stearate, glycerin, lanolin, mineral oil, petrolatum

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UV Filters

- UV filters have been traditionally divided into chemical absorber and physical blockers on the basis of their mechanism of action.

- Chemical absorber are generally aromatic compounds conjugated with a carbonyl groups.

  - These chemicals absorb high-intensity UV rays.

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- The main UV absorbent used in cosmetics:
  - Benzophenone derivatives (tetrahydroxybenzophenone)
  - Para-amino benzoic acid derivatives (para-amino benzoic acid(PABA)),
  - Paramethoxy cinnamic acid derivatives (ethyl-paramethoxycinnamate),
  - Salicylic acid derivatives (octyl salicylate).

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- Physical blockers reflect or scatter UVR.
  - Sometimes referred to as “non-chemical” sunscreens
  - Newer micro sized forms of physical blockers may also function in part by absorption
  - They may be more appropriately designated as inorganic particulate sunscreen ingredients
  - E.g. Titanium dioxide and Zinc Oxide

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- The important requirements of UV filters used in cosmetics are
  - Non-toxic
  - High UV absorbance or reflection or scattering over a wide range
  - Should not break down due to UV light and heat
  - Good compatibility cosmetics base materials

Classification of cosmetics

Based on the physical form

- **Powders**: face powder, talcum powder, tooth powder.
- **Sticks**: Lipsticks, deodorant sticks
- **Oils**: hair oils
- **Jellies**: hair jelly, hand jelly
- **Paste**: Tooth past, deodorant paste
- **Solution**: After shave solution
- **Aerosols**: After shave spray, hair sets, perfumes
- **Suspensions**

- **Based on widely used body parts**
  - Hair cosmetics
  - Face cosmetics
  - Eye make ups
  - Lip decorators and cares
  - Nail cosmetics
  - Skin cosmetics
  - Oral cosmetics

Hair cosmetics

Shampoos

- Are based on soap or synthetic detergents.
- Used to **cleanse**, and leave the hair **lustrous.**
- Variety of shampoos which have value in the form of conditioning, luster enhancing and styling capabilities.

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- Ingredients used in shampoo include:
  - **Opacifiers**: used to make the shampoo opaque
    - Glycol and glyceryl stearate , cetyl and stearyl alcohol and stearic amides
  - **Solublizing agent**: used to solubilize poorly soluble substances so as to get a clear shampoo
    - Ethyl alcohol, glycerol, propylene glycol

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- **Thickening agents**: increase the viscosty of the shampoo and provide the desired consistence for the preparation
  - Sodium stearate, sodium alginate and methyl cellulose
- **Conditioning agents**: used to improve the the manageabilty and texture of the hair
  - Lanolin and its derivative
- **Preservatives**

- Ideal properties of a shampoo:
  - Should be non-toxic, non-irritant and should not be damage the skin and sensitive organs like eyes if accidentally dropped to the eye
  - Must have an appropriate cleansing ability
  - Must produce adequate foam in soft and hard water
  - Must protect the hair from friction damage during washing
  - Hair must have a natural luster and an appropriate softness

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Hair conditioners

- Reduce the magnitude of the forces associated with combing or brushing of the hair, especially when wet.
  - Accomplished by the deposition of conditioning agents that lubricate the hair fiber, diminishing surface friction and, therefore, combing forces.
  - Deposition of a conditioning agent also causes the hair to feel softer and more moisturized.
  - Making the hair more manageable.

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- Another benefit is the reduction or prevention of flyaway hair, especially by cationic conditioners.
  - Improves the ability to align the hair fibers in a more parallel configuration.
- Some ingredients can also form a film on the hair surface that provides color retention benefits for color-treated hair.

- The commercial hair conditioners:
  - **Regular rinse-off conditioners**
    - Are normally applied after shampoo, followed by a rinsing step.
    - The most common form of conditioner sold.
  - **Intensive treatment conditioners**
    - Are used similarly to the above products, but are not meant for daily application.

- Used for intensive treatment and a higher degree of conditioning.
- Contain a higher level of active ingredients that are kept on the hair for a longer period of time prior to rinsing
- Marketed as thicker creams to provide higher conditioning

- **Leave-in products**
  - Usually are lighter and can potentially provide more significant benefits than the above rinse-off products since everything applied stays on the hair until the next shampoo.

Conditioning agents

- Cationic Surfactants
  - Cationic surfactants in the form of quaternary ammonium compounds (quats) are the most widely used conditioning agents
  - Include stearalkonium chloride, cetrimonium chloride, and dicetyldimonium chloride
  - They can bind to negative sites on the hair surface.

- Treatment with these quats results in hydrophobic coating on the fiber that render the hair softer and easier to comb.
- Buildup of static charge (flyaway) is also greatly reduced as a result of this surface modification
- Many important properties of quaternary ammonium conditioners are related to the degree of hydrophobicity of the lipophilic portion of the surfactant.

- Increasing the length of the alkyl chain of a monoalkyl quat and making it more hydrophobic leads to increased deposition on hair.
  - Cetrimonium chloride, as a result, deposits on hair to a greater extent than laurtrimonium chloride
- Increasing the number of alkyl chains also increases the deposition
  - Tricetylmonium chloride exhibits greater deposition than dicetyldimonium chloride, which, in turn, is more substantive than the monocetyl quat.

- Cationic Polymers
  - By virtue of their cationic nature, such polymers are substantive to hair.
  - The particular conditioning effectiveness of any these materials depends on the polymer structure
  - Unlike common monofunctional quats, these are compatible with anionic surfactants
  - Polyquaternium-10 (PQ-10) and polyquaternium-7 (PQ-7) are most frequently used polymers in commercial shampoos.

- Silicones
  - Used as conditioning agents in a wide variety of products including conditioners, shampoos, hair sprays and gels.
  - One of the most widely used silicones is dimethicone (polydimethylsiloxane)
  - Other important silicones are dimethiconol, dimethicone copolyol, amodimethicone

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Hair-coloring dyes

- To give a younger appearance or make hair more stylish by actively varying the color of the hair.
- Classified on the basis of their degree of durability in to
  - Temporary hair colors, semi-permanent hair colors and permanent hair colors.
- Most commonly used organic material from plant origin is '**Henna.**'

- Characteristics of a hair dye:
  - Should be non-irritating to the hair and skin
  - It should be non-toxic
  - It should be able to color the hair shaft without damaging it
  - It should be stable and should not change its color when exposed to air, sunlight, water, shampoo, or hair conditioning agent

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Hair Tonics

- Are preparation which are applied to the hair for curing baldness, relieving oily or dry skin and to prevent or cure dandruff.

- Contains a combination of at least 2 to 3 ingredients i.e sebaceous gland stimulant, rubefacient and an antiseptics

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Hair growth promotors

- Preparations made by adding varies pharmaceutical agents to an alcohol-water solution.
- Applied to the scalp to normalize its functions.
- Help to prevent dandruff and itchiness.
- Minoxidil (Rogaine®) promotes a growth of fine hair any place on the skin where there are hair follicles.

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Hair removers

- Used to remove unwanted hair from the body.
  - When the hair is removed by chemical method it is known as **depilation**.
  - When the hair is removed by plucking, electrolysis or x-ray it is known as **epilation**.
- Are available as solid, semisolids (as cream form)

- Depilatories
  - Metallic sulphide of barium, calcium and strontium, calcium thioglycerol and calcium thioglycollate.
  - Good depilatory should
    - Complete its action within 5 minutes
    - Non-toxic and non-irritant to the skin, and easy to apply
    - Elegant, odorless or pleasantly flavoured, and economical
    - Remain stable in the container

Face cosmetics

Face powder

- A cosmetic powder applied to the face to set foundation.
- Can also be reapplied throughout the day to minimize shininess caused by oily skin.
- Powders include: talc, kaoline, calcium carbonate, magnesium carbonate, zinc stearate, magnesium stearate, calcium carbonate, color and perfume.

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- There are different forms in which face powders are available:
  - **Loose powder**: the powder is the main component.
  - **Compact powder**: a solid form in which a small amount of oil has been added as a binding agent.
  - **Paper powder**: powder is applied to paper.
  - **Liquid face powder**: powders are dispersed through an aqueous solution.
  - **Kneaded powder**: has glycerin or some other solution kneaded in to it.

- Characteristics of face powder
  - It should be very fine and should not have any gritty particles
  - The ingredients should be evenly distributed
  - It should be non-toxic and non-irritant to the skin
  - It should be chemically and physically stable
  - It should spread easily and adhere to the skin

- It should have good absorbing property
- It should remove shine from the face
- It should cover minor imperfections of the face and should not appear as paint
- It should look natural
- It should not dust off in a few minutes and make repowdering necessary

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A concealer or color corrector

- A type of makeup used to cover pimples, dark circles and other small blemishes visible on the skin.

Rouge (Blush)

- A cosmetic typically used to redden the cheeks to provide a more youthful appearance, and to emphasis the cheekbones.
- The form of rouges are compact, liquid, cream and stick

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Foundation

- Skin coloring cosmetics which give uniform color to the face and conceal flaws (defect) to produce an impression of health and youth.
- Usually a liquid, cream, powder.
- Found powder compact form, oil-based foundations and emulsion foundations (O/W or W/O)

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Cold cream

- Cosmetic preparation which applied to smooth face and remove makeup.
- E.g Beeswax-borax cream

Vanishing cream

- O/W emulsions which are prepared by emulsification of stearic acid and water.
- Seem to disappear when applied on skin.

Eye makeups

Eye liner

- A cosmetic used to define the eyes.
- Applied around the contours of the eye
- To create a variety of aesthetic appearance.

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Eye shadow

- Is applied to eyelids and corners of the eyes to create shadow and produce a sense of relief in order to emphasize the beauty of the eyes.

- Has a greater variety of color than any other eye makeup.

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- The color ranges from the normal ones of blues, violet, browns and grays to the more vivid ones like greens, oranges and pinks.
  - Colored titanium dioxide coated micas (pearly pigments) are used for coloring.
- There are different types of eye shadows: Liquid-paste form, Emulsion type, Solid form, Powder compact, Oil-based stick form, Pencil type.
  - The main type is the powder compact in which the eye shadow has been pressed in to a container.

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- Quality requirements for eye shadows:
  - They should be easy to apply smoothly and have good skin adhesion.
  - They should have no oily luster when applied.
  - There should be no change in color.
  - They should not be spoiled by sweat or sebum and maintain a good appearance.
  - They should be highly safe as they used around the eyes.

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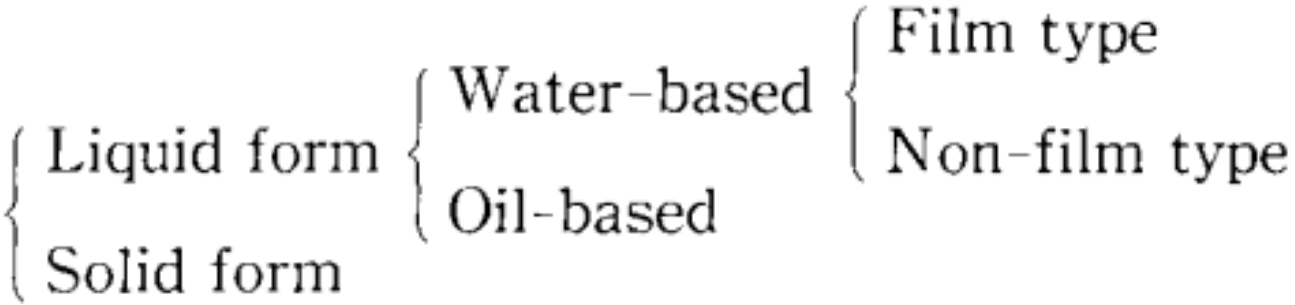
Mascara

- A cosmetic used to darken, thicken and define eyelashes.
- Found in different forms.



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- Quality requirement for mascara:
  - Non-irritating
  - Should not harden the eyelashes
  - Make the eyelashes look thick and long
  - Have an appropriate luster
  - Have an appropriate drying time
  - Appearance must not be spoiled by sweat, tears or rain
  - Easy to use and remove

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Eyebrow cosmetics

- Are used after adjusting the form of the eyebrows in the desired form, to make darker in color or brighter.
- The most common are the easy-to-use pencil and mechanical pencil types.
  - There are also powder compact and liquid types.

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Eye wrinkle care products

- The skin around the eyes becomes dry easily than on any other part of the face.
  - If the skin left in dry conditions this will cause wrinkles.
  - This is prevented by eye wrinkle care products which have a humectant effect.
- They are different types: Oil-based (stick type) and emulsion types (creams or milky lotions).

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Eye makeup remover

- To remove the different types of makeup.
- The main types are for removing water and oil-based makeup.

Lip decorators and carers

Lip gloss

- A cosmetic product used primarily to give the lips shine and sometimes subtle color.
- It is distributed as a liquid or a soft solid.
- Can be completely clear, translucent, or various shades of opacity.

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Lip balm

- It is a lip cosmetic product which generally has medicinal purposes.

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Lipstick (Lippy)

- A cosmetic product containing pigments, oils, waxes, and emollients that applies color and texture to the lips.
- Consists mainly of an oily based material and coloring agents.

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- Oil base material contain
  - Waxes which are solid at ordinary temperature, used to provide the stick form of lipsticks.
    - Natural waxes such as carnauba wax, beeswax, candelilla wax
  - Oils used are those that are liquid at ordinary temperature or whose melting points are around body temperature.
    - Natural oils such as cocoa butter, caster oil, jojoba oil, lanoline oil; hydrocarbon oils such as petrolatum and liquid paraffin and synthetic fatty acid esters.

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- Coloring agent
  - The synthetic organic colors are used in lipsticks which could be pigments or dyes.
  - Pigments determine the color of lipsticks.
  - To improve the lasting power of the color on the lips, staining dyes are used as well.
  - E.g. tetrabromofluorescein, tetrachlorotetrabromofluoscein and dibromofluorescein.

- A variety of inorganic pigments are used in addition to the synthetic organic colors.
- Titanium dioxide, red iron oxide, yellow iron oxide and black iron oxide are used to adjust the tone and brightness.
- Titanium dioxide coated mica and colored titanium dioxide coated mica use to give a pearly luster.
- Other inorganic pigments are treated using various methods in order to enhance their dispersion and stability.

- Quality of good lipstick:
  - Non-toxic and non-irritating
  - Free from gritty particles
  - Easily applicable and easily removable if need arises
  - Good odor
  - Give shine and smooth appearance, and maintain its lip color long after application
  - Do not break during use and it should maintain its firmness till whole of it is used up

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Lip Plumper

- A cosmetic product used to give the lips an enhanced, fuller look.
- Distributed as a viscous liquid.
- Applied to the lips with a roller or brush applicator.
- It can be translucent or have various tints, and can be worn alone or over regular lipstick.

- Lip plumper works by irritating the thin, delicate skin of the lips with ingredients like menthol, camphor cinnamon or cayenne pepper.
  - This makes the lips swell slightly, which may also diminish the appearance of fine lines in that area
  - A lip plumper's effects are temporary, so it must be reapplied throughout the day to maintain the results.

Nail cosmetics

Nail polish

- Nail varnish or nail lacquers or nail enamels.
- This is a lacquer that is applied to the nails of both the fingers and toes, usually cosmetically.
- The act of simply polishing the nails without applying a chemical layer afterwards is called nail buffing.

- Purpose of nail polishes:
  - **Aesthetic**: they offer more refinement and elegance and allow for a wide range of personal preferences**.**
  - Nail varnish plays a **protective role**: it forms a film on the nail surface, which is both tough and flexible**.**
  - It also maintains a more constant degree of **nail hydration**.

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- The main constituent of the film that remains on the nail after drying is **nitrocellulose**.
- The film former has a lot of qualities: it is hard, tough, stable, and waterproof.
  - But, it is neither sufficiently adherent nor glossy or flexible.
  - To improve adherence and gloss, **film modifiers** are added.
  - **Plasticizers** are added to increase flexibility.

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- The nail polish bottle may also solvents and thinners, pigments and dyes, thixotropic agents, as well as other additives.

- Solvents:

  - The most commonly used solvents are alkyl esters and glycol ethers.

  - These solvents, which have different boiling points and evaporation rates, allow the regulation of drying time.

  - They also allow lower viscosity, which improves brushability.

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- Thinners:
  - Help to regulate the evaporation rates and stabilize viscosity.
  - A polish low in viscosity is easy to apply and leaves a homogeneous film.
    - If viscosity is too low, the coverage of the film will be insufficient.
    - If viscosity is too high, the film will be thick and streaky.
  - E.g. ethanol, isopropanol, butanol and toluene.

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- The perfect nail polish:
  - Has to be easy to apply, and it should dry quickly,
  - Should leave a shiny, smooth, even, hard, and flexible film that is able to last five days,
  - Should be removed without leaving any trace and should not have any side effects,
  - Should be stable in the bottle,
  - Should offer a wide range of colors, enabling one to get the expected aesthetic effect.

- Unwanted Effects of Nail Polishes
  - The nail polishes can cause an orange staining of the nail plate
  - Nail lacquers can cause keratin granulation
  - Nail varnishes can also cause allergic contact dermatitis, more rarely, contact urticaria

Keratin granulation

Orange staining

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Nail Polish Remover

- Dissolve nitrocellulose and remove lipids from the nail plate.
- They mainly contain a mixture of organic solvents, with small amounts of oils added to counteract the drying effect of the solvents.
- Should not be used more than once a week and should not be left too long in contact with the nails and the skin.

Skin Cosmetics

- Skin cosmetics are applied to the dead cells of the corneal layer.
- Basic function:
  - Anti-drying, cleansing, UV damage prevention, anti-oxidation and invigoration.
  - Clean up skin problems.
  - Whitening effect to combat skin aging associated troubles.
  - Prevent wrinkles, sagging skin and acne.
  - To mask body odor.

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Moisturizers (emollients)

- To hold moisture in the skin.
- Work best when applied while the skin is still wet from a bath or shower.
- These don’t actually add moisture to skin, rather form a physical barrier that hinders evaporation of water from the skin.

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Anti-aging Cream

- To make the consumer look younger by reducing visible wrinkles, expression lines, blemishes, pigmentation changes, discolorations of the skin.
- Despite great demand, many such products and treatments have not been proven to give lasting or major positive effects.
- A decrease in wrinkle depth of 10% is typical.

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- Conventional anti-aging creams usually contain anti-aging ingredients:
  - **Retinol** (in the form of retinyl palmitate): to reduce fine lines and pores.
  - **Epidermal Growth Factor**: to stimulate cell renewal and Collagen production and strengthen elasticity and structure.
  - **Alpha hydroxy acids (AHAs)**: help to dissolve the intracellular "glue" that holds the dead cells together on the skin and enhances the exfoliation of the dead cells.
  - **Antioxidant**

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Depilatories

- Are sulfides of calcium and barium.
- Used for removing hair from the skin.

Bronzers

- A cosmetic product that darken skin color.
- Form: creams, powders, sprays, gels, and lotions .

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Antiperspirants and Deodorants

- The major components of body odor are products decomposed from a mixture of a sweat and lipid broken down by the normal bacterial flora of the skin.
- One group of unpleasant smelling breakdown product is the lower FAs.
- Cosmetics for preventing body odor contain antiperspirant perfumes and antibacterial agents.

- **Antiperspirants**
  - Are topically applied products designed to reduce underarm wetness by limiting eccrine sweat production.
  - Suppress production of perspiration due to their strong astringent action on the skin.
  - Active Ingredients for Antiperspirants:
    - Zirconium and aluminum chlorides, aluminium hydrochloride, potassium aluminum sulfate, zinc oxide and zinc paraphenol sulfonate

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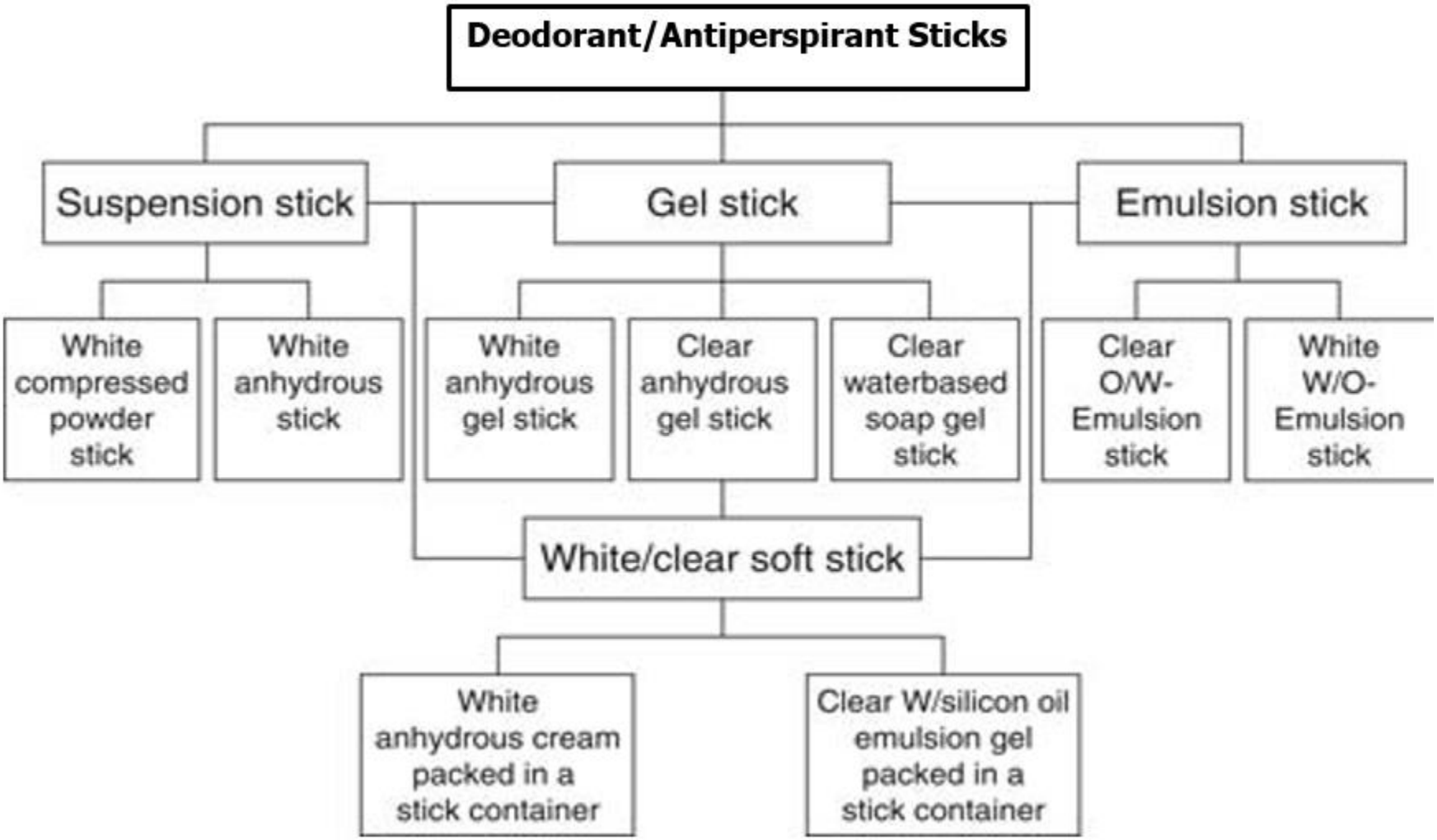
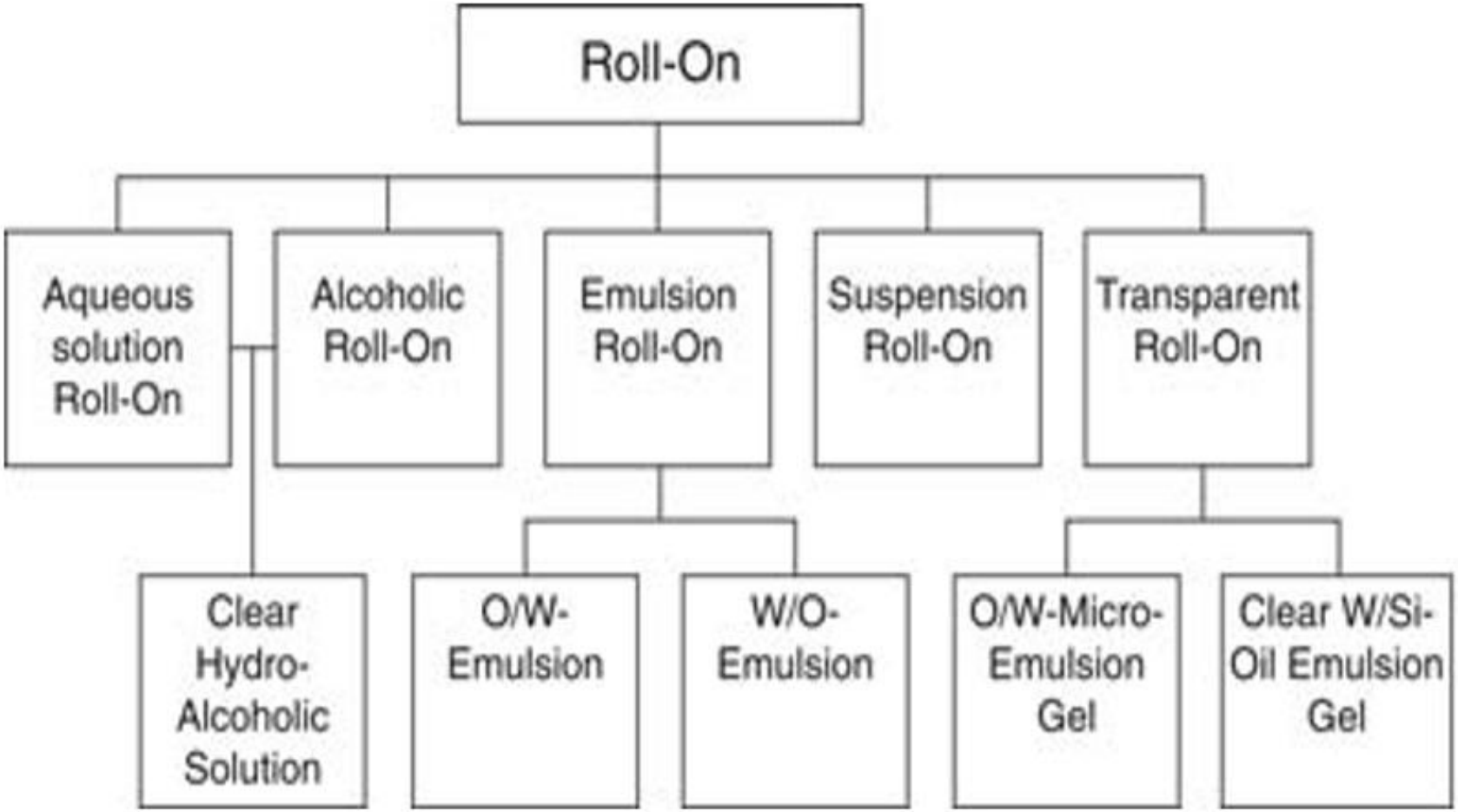
- Application forms for antiperspirant actives: sticks, roll-ons, creams, pump sprays, aerosols, gels, and powders.
  - The three most important product forms are **sticks**, **roll-ons**, and **aerosols**.
  - Sticks application form that is prepared in a relatively long and slender, often cylindrical form.
  - Roll-on application form applied to the underarms with a rolling applicator.


Deodorant/Antiperspirant Sticks
Suspension stick
Gel stick
Emulsion stick
White compressed powder stick
White anhydrous stick
White anhydrous gel stick
Clear anhydrous gel stick
Clear waterbased soap gel stick
Clear O/W-Emulsion stick
White W/O-Emulsion stick
White/clear soft stick
White anhydrous cream packed in a stick container
Clear W/silicon oil emulsion gel packed in a stick container


Roll-On
Aqueous solution Roll-On
Alcoholic Roll-On
Emulsion Roll-On
Suspension Roll-On
Transparent Roll-On
Clear Hydro-Alcoholic Solution
O/W-Emulsion
W/O-Emulsion
O/W-Micro-Emulsion Gel
Clear W/Si-Oil Emulsion Gel

- **Deodorants**
  - Products designed to reduce underarm odor.
  - They are considered in the United States as cosmetics, while antiperspirants are treated by the FDA as drugs.
  - Deodorants tend to be less irritating than antiperspirants.

- There are different types deodorant with different strategies to reduce underarm
  - Antiperspirant active-containing deodorants
  - Odor-masking deodorants
  - Odor-neutralizing deodorants
  - Odor-quenching deodorants
  - Esterase inhibitors
  - Antimicrobial active-containing deodorants

- Application forms for deodorant actives:
  - Typical application forms are sticks, roll-ons, creams, pump sprays, aerosols, and gels.
  - Sticks, pump, and aerosols most common.
  - Deodorants can be formulated in acidic, neutral, or alkaline environment.

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Sunscreen formulation

- UV rays in sunlight triggers production of the pigment melanin, which then protects the deeper layers of the skin from damage.
- Excessive exposure to ultraviolet radiation causes premature aging of the skin and leads to skin cancer.
- Most sunscreen formulations block UV-B radiation.

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- UV filters used in cosmetic sunscreen formulations are roughly considered belonging to two groups
  - **Organic molecules** deliberately selected for their UVR-absorbing capacities (i.e., organic UV filters)
  - **Particles** that reflect, or scatter UVR. Particles may be inorganic (i.e., metal oxides) or organic (microfine polymeric molecules).
- PABA derivatives are now used as a UV-B filter in about 90% of all sunscreen lotions.

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- Sunscreens also contain chemicals that interfere with secondary reactions such as
  - Generation of free radicals and reactive oxygen species in the skin (antioxidants)
  - Generation of inflammatory mediators (antinflamatory)
  - Exert long-term protective effects on degenerative skin damage.

Oral Cosmetics

- Two groups:
  - Oral cleansing products
  - Mouth fresheners
- Preparation for external use which clean the teeth and surrounding them, cleanse and refresh the inside of the mouth, prevent dental caries and periodontal disease.
- Divided into dentifrices and mouthwash

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Dentifrices

- Are applied with a tooth brush for cleansing the accessible surfaces of the teeth.
- Enhance appearance of the teeth, reduce tooth decay and bad odor of the mouth and make the gum healthy.
- Ingredients: polishing agents (abrasive), surface active agents (detergent), humectants, binders, sweetening agents, flavoring agents, preservatives.

Ingredient category	Ingredients	Effect · Action
Abrasive	· Calcium carbonate · Calcium phosphate, dibasic · Silica · Aluminium hydroxide, etc.	· Principal ingredient of dentifrice · Remove dirt without scratching the tooth surface
Humectant	· Glycerin · Sorbitol, etc.	· Give moistness and plasticity (cream form) to the powders in the dentifrice
Foaming agent	· Sodium lauryl sulfate, etc.	· Disperse the dentifrice throughout the mouth and clean away the dirt in the mouth
Binder	· Sodium carboxymethyl cellulose · Carrageenan, etc.	· Bind the powder and liquid ingredients together and give moldability
Flavoring agent	· Sodium saccharin · Peppermint oil · Spearmint oil · Menthol, etc.	· Adjust flavor · Make dentifrice more palatable by giving a refreshing taste and smell
Coloring agent	· Permitted colors	· Make the dentifrice more attractive looking
Preservative	· Ethyl paraoxybenzoic acid · Butyl paraoxybenzoic acid, etc.	· Prevent deterioration of dentifrice
	· Purified water	· Adjust viscosity and consistency of dentifrice
Pharmaceutical agent	· Fluoride · Antibacterial agents · Anti-inflammatory agents, etc.	· Prevent dental caries, pyorrhea and gingivitis, stop halitosis and enhance effectiveness in removing oral cavity contaminants

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Mouth wash (Mouth rinse)

- Similar in form to a liquid-form dentifrice but used without toothbrush.
- An appropriate amount is put in the mouth to rinse it out and discarded afterwards.
- Mouthwashes are classified by usage and form into: Directly used type, Concentrated type and Powder type.

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- Use to clean the inside of the mouth, prevent halitosis and refresh the mouth
- Ingredients: ethanol and other solvents, humectants, solubilizers, flavoring agents, preservatives and pH regulators.
- In powder type, sodium bicarbonate and other diluting agents are used in the place of liquid ingredients.

Category	Ingredient	Effect · Action
Water	Purified water	Adjustment of viscosity, consistency, volume, etc.
Solvent	Ethanol, etc.	Dissolution of flavoring agents, give refreshing feeling
Humectant	Glycerin, etc.	Moisturizing of mouth, aid dissolution of flavoring agents
Solubilizer	Polyoxyethylene-hydrogenated castor oil, polyoxyethylene-polyoxypropylene glycol, sodium lauryl sulfate, etc.	Solubilization of flavoring agents, cleaning inside of mouth
Flavoring agent	Sodium saccharin, Menthol, Peppermint oil, etc.	Give a cool, refreshing feeling, special flavor
Preservative	Ethyl paraoxybenzoate, Sodium benzoate, etc.	Prevent product deterioration
Coloring agent	Permitted colors, caramel, etc.	Color to give attractive appearance
pH adjuster	Phosphoric acid salts, citric acid salts	pH adjustment
Pharmaceutical agent		Stop halitosis, prevent dental caries, periodontal diseases, etc.

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Mouth Freshener

- Is preparation for internal use designed to prevent nausea and other feelings of discomfort
- They found in the form of pills, lozenge and liquids.
- The liquid form is packed in a squeeze or pump type container and is squirted into the mouth as a mist.

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- Ingredients used to flavor mouth fresheners have a strong freshening effect and include: Cinnamon, mint oil, fennel oil, D-camphor, L-menthol.
  - Depending on the form of mouth refreshner, other diluting agents, flavoring agents and preservatives are also used.